



CITY OF LANCASTER
Water Pollution Control Department

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February 28, 2005

Ohio Environmental Protection Agency
Lazarus Government Center
Division of Surface Water
Permit Processing Unit
122 South Front Street
P.O. Box 1049
Columbus, OH 43216-1049

Re: NPDES Permit No. 4PD00001*ID
City of Lancaster Combined Sewer System Long Term Control Plan - Addendum

Ladies and Gentlemen:

In compliance with Paragraph A of Part I, C – Schedule of Compliance of the City of Lancaster NPDES Permit, this letter includes the City of Lancaster's Long Term Control Plan - Addendum. This document is submitted as an addendum to the City of Lancaster Long Term Control Plan submitted in June 2000. We understand this addendum completes the requirements for the Long Term Control Plan and will result in an approval of the Plan.

Enclosed are five copies of the above referenced addendum. If you have any questions regarding these documents, please feel free to contact me at 740-687-6664.

Sincerely Yours,

Michael B. Nixon
Superintendent

c: T. Bulcher, Malcolm Pirnie, Inc.
K. Huston, City of Lancaster

City of Lancaster, Ohio
Water Pollution Control Department

Long Term Control Plan
Addendum

March 1, 2005



**MALCOLM
PIRNIE**

INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS & CONSULTANTS

**Collection System Overflow Plan
Long Term Control Plan - Addendum
Water Pollution Control Department
Lancaster, Ohio**

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1.0 INTRODUCTION

1.1 REGULATORY STATUS

The City of Lancaster owns and operates the City of Lancaster Water Pollution Control Facility and wastewater collection system. The City is authorized to discharge pollutants from the plant and combined sewer overflow (CSO) structures under a National Pollution Discharge Elimination System (NPDES) permit issued by the Ohio Environmental Protection Agency (Ohio EPA), Permit No. 4PD00001*ID.

In the City's NPDES permit, effective December 1, 1997, the Ohio EPA required that a Combined Sewer System Characterization be completed by December 1, 1999 and a Combined Sewer System Long Term Control Plan (LTCP) be completed by June 1, 2000.

In accordance with these requirements, and using guidance from the Ohio EPA's published CSO Strategy, an extensive program was started in early 1995 to estimate the effects of CSOs (if any) on the water quality of streams in the Lancaster area. This program included the following elements:

- Sewer System Documentation
- Sewer System Flow Monitoring
- Sewer System Computer Model
- CSO Sampling
- Aquatic Life/Recreational Use Attainment Analysis
- Public Participation

Both the Combined Sewer System Characterization and the Combined Sewer System Long Term Control Plan were submitted to the Ohio EPA for review. The Long Term Control Plan found no significant water quality impacts or impairment of designated uses.

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During the renewal process for the City of Lancaster's current NPDES permit (effective March 1, 2003), the Ohio EPA reviewed these documents and other submittals and concluded the following additional items were necessary as described in Part I, C – Schedule of Compliance:

1. Reduction or elimination of combined sewer overflows from specific CSO structures as identified by the Ohio EPA.
2. Plan for the provision of new facilities at the wastewater treatment plant to treat increased peak flows caused by reduced CSO discharges.
3. Plan to provide full treatment of wastewater flows from new and separately-sewered areas in high growth areas of the City.

Specifically, the Ohio EPA required that four combined sewer overflows be considered for elimination or minimization of combined sewer discharges:

- CSO 1004
- CSO 1006
- CSO 1020
- CSO 1034

Since the elimination or reduction in CSO volume will result in larger peak flows and volumes at the Lancaster Waste Water Treatment Plant, the Ohio EPA also required an analysis of the options available to treat the additional flow. Treatment options to be considered include full secondary treatment, high-rate treatment using physical / chemical processes, and / or storage. These analyses are to be submitted to the Ohio EPA by March 1, 2005.

Presently, the City is in compliance with its NPDES permit. Although submitted in 2000, the City's Combined Sewer System Long Term Control Plan has not been approved by the Ohio EPA. The purpose of this document is to provide supplemental

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information in order to receive approval of the City's Long Term Control Plan. In the meantime, the City has implemented applicable portions of its Long Term Control Plan.

1.2 APPROACH

The Long Term Control Plan – Addendum will include an analysis of the collection system and the wastewater treatment plant alternatives necessary for reduction of CSO discharges. The collection system alternatives evaluated must eliminate and/or minimize CSO discharges. Each alternative evaluation includes:

- Costs
- Benefits
- Impact on user's rates
- Construction and implementation schedules
- An affordability analysis on the selected alternative.

1.3 OVERFLOWS OF CONCERN

The Ohio EPA identified four combined sewer overflow structures for elimination or reduction: CSO's 1004, 1006, 1020, and 1034.

CSOs 1004, 1006, 1020, and 1034 are located on interceptor sewers that serve both combined and separate sewered areas. All structures function as designed, conveying dry weather flow for treatment and only overflowing to the receiving stream during wet weather.

CSO 1004 discharges to the Hocking River. It is a significant overflow for a 48" interceptor delivering flows to the WPCF from the west side of Lancaster. CSO 1006 discharges to the Hocking River. CSO 1020 is a non-active CSO and has been closed. CSO 1034 discharges to Baldwin Run.

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1.4 DESIGN BASIS

In analyzing CSO reduction alternatives, a design storm was selected and modeled in order to size the proposed facilities. The design storm selected was based on the goal of reducing the number of overflows to an average of four times per year.

On average, a storm with a return period of 3 months will occur four times per year. For the Lancaster system, a 2 hour storm duration was determined to be the critical storm duration. This was established by simulating a series of 3-month return period design storms with the following storm durations: 1-hour, 2-hour, 3-hour, 6-hour, and 12-hour. The peak CSO flow rate was highest for the 2-hour storm, making it the critical duration. It is important to note though, that the 3-month, 2-hour design storm used during the analysis only established an approximate level of control needed to reduce the number of overflows to four times per year.

The design storm was a 3-month, 2-hour design storm. The rainfall amount for this storm was 0.81 inches, as obtained from the Rainfall Frequency Atlas of the Midwest. The rainfall hyetograph for this storm was developed using a first-quartile Huff distribution.

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2.0 OVERVIEW OF THE WATER AND WASTEWATER MASTER PLAN – SEWER COLLECTION SYSTEM

2.1 PROJECT BACKGROUND

The City of Lancaster is located in Fairfield County, approximately 30 miles southeast of downtown Columbus, Ohio. The population of Lancaster, per the 2000 census, is approximately 35,335, covering approximately 17 square miles. The City is currently experiencing considerable growth on the northwest side along the existing U.S. Route 33 Corridor. Growth to the west and northwest is expected to continue, particularly with the construction of the U.S. Route 33 Bypass. The State of Ohio is in the final phase of construction for the U.S. Route 33 Bypass which should be completed by the end of 2005. The City recognizes that with the construction of the bypass, there will be significant pressure for future development in the area.

Malcolm Pirnie, Inc. was selected by the City to provide water and wastewater master planning services for the entire incorporated area of the City and the new U.S. 33 Bypass / Rock Mill Corporate Park area located west of the City. Malcolm Pirnie, Inc. is in the process of finalization of the Master Plan Study for Water and Wastewater Improvements. The comprehensive Master Plan identifies and prioritizes future water and wastewater capital improvement projects. The Master Plan originally identifies two specific planning goals, “Near-Term” and “Long-Term” Facilities. The Near-Term Facilities would provide capital improvement projects that are necessary to serve projected development needs that will result when the bypass construction is completed in 2005. The Long-Term Facilities would provide infrastructure improvements for the City service area through the year 2025, and ultimately through the year 2045.

2.2 PLANNING AREA

The Master Plan project planning area includes the entire City limits of Lancaster. In addition, other areas to the west of the City are included to consider development

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associated with the new U.S. 33 Bypass and north of the City to consider anticipated growth trends toward Columbus. The areas west and north of the City limits were determined based on past planning reports and through workshops with Malcolm Pirnie and City staff. The approximate overall boundaries include the City corporation limits to the east, the interchange of U.S. 22 and the U.S. 33 Bypass to the south, Hocking and Greenfield Townships to the west and Coonpath Road to the north. The planning area is outlined on Figure 2-1.

Areas of possible development were determined by using land use information obtained from Fairfield County as well as the current zoning code for the City of Lancaster. Areas are designated on the attached Figure 2-1 as single-family residential (SF), multi-family residential (MF), estate district (ED), commercial (C), or industrial (I) properties.

2.2.1 Planning Improvement Phases

A schedule of improvements will help to identify and prioritize the City's future capital improvement projects. It will help the City to provide service in a phased implementation program that matches the City's level of needs. In order for Lancaster to serve their growing community efficiently and effectively, the planning documents are comprehensive and can be easily updated in response to changing growth trends and regulations. This not only will ensure that orderly development can be achieved, but it will also help to create a smooth transition from the master plan phase to the design phase.

To effectively match level of needs in a phased implementation program, future water and wastewater capital improvement projects were identified as Near-Term and Long-Term improvement phases within the Master Plan. In addition to the Near-Term and Long-Term phases, the City identified an additional critical area in need of more "Immediate" service for the U.S. 33 Bypass development. Therefore, the planning area was reviewed in three separate improvement phases, to ensure that the interim expansions

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are coordinated for the future systems. Planning improvement phases for the projected growth areas are outlined hereafter.

- **Immediate Needs:** Utility services associated with the completion of Rock Mill Corporate Park, Phase 2, located on the east side of the U.S. 33 Bypass and S.R. 188 interchange.
- **Near-Term Needs:** Utility services for initial development associated with the completion of the U.S. 33 Bypass west of the Lancaster City limits and in the River Valley Highlands residential development area.
- **Long-Term Needs** – Utility services for all development associated with the completion of the U.S. 33 Bypass west of Lancaster and improvements within the City service area projected for the years 2025 and 2045.

The areas that were identified as the most Immediate need for service include Rock Mill Corporate Park, Phase 2, shown as area I-5 on Figure 2-1, as well as areas I-3, I-4, C-2, C-3, C-4 and SF-6.

The Near-Term phase includes service for areas within the Immediate service area as well as area C-5. In addition, 25% of the projected growth for the year 2025 in areas SF-12, SF-13, SF-14 and SF-16 is also included as part of the Near-Term needs.

The infrastructure for Immediate and Near-Term service needs was outlined in detail in order to ensure efficient and orderly expansion for the Long-Term service needs. The Long-Term phase includes service for all the remaining development associated with the US 33 Bypass and improvements within the existing City service area.

2.3 PROJECTED GROWTH AND FLOW DESIGN CRITERIA

Projected design flow is based on the references and resources discussed in Section 2.2 that were established in order to effectively plan for the expansion of the City's utilities. Future flow increases in Lancaster's water and wastewater systems were based on projected growth associated with future residential, commercial and industrial

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developments. Future flows associated with the projected developments were incorporated into the Lancaster water and wastewater utility system models to estimate impacts on the respective utility systems.

2.3.1 Average Flows

The average day water and sanitary flows were projected to be 1,000 gallons/acre/day for residential usage based on guidance from the City of Lancaster’s Sanitary Sewer Design Manual. For single family homes, it is assumed that there would be three people per unit. At three and one third units per acre, the total projected population would be 10 people per acre for a fully developed area. Lower densities could occur for single family homes down to three people per acre. Higher population densities could occur for multi-family homes up to 65 people per acre. Therefore, 10 people per acre was selected as the population density for a fully developed area. Based on 100 gallons per person per day, the average day flow for a fully developed residential area was projected at 1,000 gallons per day per acre. The Projected Development Acreages and Populations are summarized in Table A-1 and table A-2 of Appendix A.

For commercial development, the average day water and sanitary flows were projected to be 1,000 gallons per acre per day for fully developed areas. This was based on guidance from the City of Lancaster’s Sanitary Sewer Design Manual. Although the manual does not have a specific recommendation for commercial development, the recommend water usage rate for the “Light or Low Density Industrial” and “Scientific Research” use groups is 1,000 gallons per acre per day.

For industrial development, the average day water and sanitary flows were projected to be 1,300 gallons/acre/day for fully developed areas. This was based on guidance from the City of Lancaster’s Sanitary Sewer Design Manual. The recommended water usage rate varies from 1,000 gallons per acre per day for “Light or Low Density” industrial, to 1,500 gallons per acre per day for “Medium Density” industrial, to 3,000 gallons per acre

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per day for “High Density” industrial. An intermediate average day flow rate of 1,300 gallons per acre per day was selected for fully developed industrial areas.

The above flow rates per acre for residential, commercial, and industrial were then used to determine the projected average flows for each of the areas designated for future development as Shown on Figure 2-1. The average day flows were then used to determine the appropriate peak flows for sizing future water and wastewater piping and facilities.

In addition to the average flows associated with projected future development shown on Figure 2-1, additional existing flows associated with areas outside the City that are not currently served by the City of Lancaster, are also included in the total projected average flows.

It is expected that Fairfield County will connect to the City’s water and wastewater system from six existing subdivisions: Knox Acres, Carpico Drive, Peters, Kiester Manor, Pleasant Lea, and Lakeside. The City currently has a wastewater service contract with Greenfield Township for a maximum capacity of 400,000 gallons per day. Currently, the City is receiving approximately 150,000 gallons per day from Greenfield Township. Lancaster expects that with the anticipated growth in the area, Greenfield Township may wish to contract with the City of Lancaster for water and additional wastewater services. Therefore, the Master Plan includes recommendations for necessary facilities to serve projected development from Greenfield Township as shown on Figure 2-1.

2.3.2 Peak Wastewater Collection and Treatment System Flows

A peaking factor of 3.5 is recommended in the Lancaster Sanitary Sewer Design Manual to calculate peak hourly sanitary flows. However, this value is intended for developers who are installing small system lines for individual developments. Since the

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Master Plan focuses on main lines for a developer to connect local arteries, the 3.5 peaking factor is not applicable across the spectrum of all collection system sizes. Therefore, the interceptor sewer lines were sized to transport peak hourly sanitary flow capacities that were calculated in accordance with the 10 States Standards' Ratio of Peak Hourly Flow to Design Average Flow. This formula is based on equivalent population. For an area with an equivalent population of 1,000 (average day flow of 100,000 gallons per day at 100 gallons per person per day), the hourly peaking factor would be 3.8. For an average day flow of 1,000,000 gallons per day, the hourly peaking factor would be 2.95 and for 2,000,000 gallons per day, the hourly peaking factor would be 2.65.

The adjusted peak sanitary flows in each of the associated drainage basins projected for the wastewater alternatives are summarized in Table A-1 and Table A-2 of Appendix A. Piping was sized based on 2045 peak hourly flow projections. Trunk sewers were determined for projected areas of development. Smaller branch lines and local arteries were not considered in the Master Plan. The facilities were sized for the three improvement phases (Immediate, Near-Term, and Long-Term) such that the facilities initially completed can ultimately handle the Long-Term 2045 peak flow conditions.

2.4 CURRENT WASTEWATER FLOWS

The City of Lancaster's existing wastewater system service areas are summarized schematically in Figure 2-2. The service areas are identified as either sanitary service area (sanitary only) or combined service area (sanitary and storm sewer). In addition, the existing wastewater capture areas (sewer sheds) for the City's collection system are outlined in Figure 2-3. As can be seen in the figures, there are currently 32 wastewater system capture areas. 17 of the capture areas collect sanitary only, but then connect to a combined system of sanitary and storm water. Some of the separated sewers could be intercepted before connecting to the combined system as part of the master plan improvements to help reduce existing CSO impacts on receiving waters and meet regulatory requirements. They include:

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- **Existing Capture Area 1**
This flow can connect to a new express sewer to the existing WPCF, reducing the stress on CSO 1034. Also, Capture Area 1 includes the industrial areas I-7 through I-10 identified in Figure 4-3 of the June 2000 Long Term Control Plan for Lancaster.
- **Existing Capture Area 10**
This flow can connect to a new express sewer to the existing WPCF, reducing the need for CSO 1006.
- **Existing Capture Areas 12A, 12B, 13, and 32**
This flow is all transported to the South Broad Street Pump Station. The pump station force main can connect to a new express sewer to the existing WPCF.
- **Existing Capture Areas 28, 29, 30 and 31**
Re-routing this flow to a new water pollution control facility or via an express sewer to the existing Water Pollution Control Facility would also relieve the YMCA Pump Station, which is currently operating at full capacity. The new water pollution control facility would also provide the infrastructure for the growth to the west and northwest of Lancaster.
- **Lake and Allen Sewer Separation**
This Sewer Separation Project will provide full separation of Sewer Shed 8D and partial separation of Sewer Shed 8C, 8E, and 11.

2.5 WASTEWATER COLLECTION SYSTEM MODEL

Malcolm Pirnie analyzed the existing wastewater collection system conveyance capacity utilizing the existing City SWMM model to estimate the impact of the design flow from the U.S. 33 Bypass Area on the existing wastewater system and the impact of future flows on the entire Lancaster service area. In addition, Malcolm Pirnie assessed the potential interaction of the CSO System with any projected extension or improvements to the separate sanitary sewer system associated with service to the U.S. 33 Bypass Area.

The model was used to characterize the future sewer system based on projected

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wastewater flows, determine the corresponding CSO volume during wet weather for a range of storm events, and establish the hydraulic capacity of the sewer system during dry weather and wet weather.

2.6 EVALUATIONS OF ALTERNATIVES

To determine how to best serve the growing needs of Lancaster, several wastewater collection and treatment alternatives were analyzed in the Master Plan. Optimal areas for construction and projected development service needs were identified. For each alternative developed, a brief description including a list of advantages and disadvantages was prepared for review. Each alternative was discussed for consideration during a project meeting with the City and MPI. Alternatives that were deemed undesirable were eliminated from consideration. The remaining alternatives identified as feasible design options were compiled into four core alternatives with variations in the flow paths and facilities. They were then further analyzed based on the City's needs. Refer to Figure 3-1 for a summary of the alternatives development and analysis process.

As part of the design alternative analysis, various criteria were discussed as appropriate to determine if the alternative should be considered for further evaluation. The alternatives were analyzed on a system-wide basis with the following considerations:

- **The City's Long Term Control Plan:** Commitments to keep CSO discharge volumes to 1995 levels (antidegradation). Reduce combined sewer discharges in anticipation of additional Ohio EPA requirements.
- **Future Growth:** Provide sewer service to facilitate future growth in the City of Lancaster and projected growth areas without increasing combined sewer overflow volumes.
- **Capacity and Condition:** The condition/capacity of the existing interceptors, CSO structures and existing pump stations has to be considered.
- **Regulatory Requirements:** Consider the number and type of permits

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required for the site. Some permits can significantly increase the time and cost required to use a particular site. In addition, permits may be denied for sites that conflict with environmental issues. Sites with minimal environmental concerns are preferred.

- **Land Acquisition:** The greater the number of landowners, the greater the effort to obtain the proposed site. If a landowner is unwilling to sell at a fair price, the City will have to enforce eminent domain, which may increase the time and effort required to purchase the property. Sites with one or two landowners are preferred.
- **Construction Access and Feasibility:** Relatively flat sites with appropriate subsurface characteristics for foundation support are preferred. Sites with access to major roads are also preferred.
- **Proximity to Existing Water and Wastewater Service Needs:** Access to existing infrastructure is preferred. It will help to control costs associated with additional construction materials and labor, site acquisition and permitting.
- **Aesthetic Concerns:** Consider potential impacts that could affect public acceptance, such as odor control and visual impacts. Sites and system elements with minimal public controversy are preferred.
- **Maintenance:** Consider the frequency and level of effort associated with routine and special maintenance tasks. System elements with minimal maintenance requirements and safety hazards are preferred.
- **Performance:** Consider the ability to meet the system requirements for the three different improvement phases. A system element that is flexible to meet future demands efficiently and effectively is preferred.
- **Capital Cost:** Economical options that provide the high value for the cost are preferred.

2.6.1 Developed Alternatives

The alternatives developed considered new trunk sewers, wet weather storage, new treatment facilities, and expansion of existing treatment facilities. The alternatives identified in the Master Plan are summarized below. Figure 2-4, Figure 2-5, Figure 2-6, and Figure 2-7 summarize the varied flow paths for each core alternative for Near-Term

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(2025) and Long-Term (2045) flow. The four core alternatives are:

- **Master Plan Alternative 1:** No New Satellite Water Pollution Control Facility.
- **Master Plan Alternative 2:** New Upper Hocking Water Pollution Control Facility.
- **Master Plan Alternative 3:** New Hunters Run Water Pollution Control Facility with YMCA Pump Station Upgrade.
- **Master Plan Alternative 4:** New Hunters Run Water Pollution Control Facility without YMCA Pump Station Upgrade.

As can be seen on Figure 2-4 through Figure 2-7, the varying flow schemes for each core alternative resulted in multiple alternatives for consideration. Each flow variation was reviewed to determine if it was a feasible option to consider for further evaluation. Alternatives that were eliminated from further evaluation are shown on Figure 2-4 through Figure 2-7 with strikeout. The remaining four alternatives selected for final consideration in the Master Plan Report are presented hereafter:

2.6.2 Alternative 1.A.(1): No New Satellite Water Pollution Control Facility

Utilizing the existing wastewater collection and treatment system to its full capability to process the projected flows for 2045 would require the following major facilities (Refer to Figure 2-8):

- Hunters Run drainage basin express sewer to the existing WPCF.
- Rock Mill Lift Station.
-Immediate: 1.0 mgd
- Lake and Allen Sewer Separation.
- New WPCF adjacent to the existing WPCF site.
-2025: 1.00 mgd
-2045: 2.60 mgd upgrade
- Baldwin Run Express Sewer.

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- Broad Street Pump Station Express Sewer.
- Upper Hocking Pump Station.
 - Near Term: 6.5 mgd
 - 2025: 4.0 mgd upgrade
 - 2045: 4.5 mgd upgrade
- Approximately 224,802 feet of sewer line ranging between 8-inch and 60-inch diameter.
- Captures all existing wastewater service areas discussed in Section 2.4 to reduce CSO impacts.

2.6.2.1 Advantages for Alternative 1.A.(1):

- Adjacent property could be purchased to build a new WPCF before 2025. There are approximately 58 acres adjacent to the existing WPCF to the south and across the Hocking River. This property is currently zoned as industrial – moderate and could be purchased by the City. The City zoning code allows utilities to construct “by right” in any industrial area (low, moderate or high).
- Adjacent facilities would be easier to manage. Issues such as operations, maintenance and permitting are contained to one general area. Access and permitting would be minor. Also, solids from the new WPCF could be pumped to the existing WPCF rather than hauled by a truck.
- Other alternatives would only use 7.5 mgd of the total 10 mgd available at the existing WPCF. Routing all of the flow to the existing site would use the entire 4 mgd capacity remaining at the existing WPCF. This would allow a smaller rated capacity for the new WPCF as well as delaying its construction approximately 5 to 10 years.
- Avoids stream water quality issues at Hunters Run.
- Less stringent treatment limits than for Hunters Run.
- Public acceptance for a new WPCF site not required.

2.6.2.2 Disadvantages for Alternative 1.A.(1):

- The existing WPCF is currently treating 6.5 mgd. There is no room for expansion beyond 10 mgd.
- Upper Hocking Pump Station requires a substantial length of force main.

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- Requires a substantial amount of sewer to be installed during the Near Term phase in order to transport Hunters Run flows to the WPCF.

2.6.3 Alternative 2.A.(1): New Upper Hocking Water Pollution Control Facility

Construction of an Upper Hocking River WPCF to process projected flows from both the Upper Hocking River and Hunters Run drainage basins for 2045 would require the following major facilities (Refer to Figure 2-9):

- Rock Mill Lift Station.
 - Immediate: 1.0 mgd
- Lake and Allen Sewer Separation.
- New Upper Hocking WPCF at Collins Road.
 - Near Term: 2.00 mgd
 - 2025: 2.10 mgd upgrade
 - 2045: 2.70 mgd upgrade
- Upper Hocking Pump Station.
 - Near Term: 4.75 mgd
 - 2025: 4.25 mgd upgrade
 - 2045: 4.0 mgd upgrade
- Hunters Run Pump Station.
 - Near Term: 0.25 mgd
 - 2025: 1.10 mgd upgrade
 - 2045: 1.20 mgd upgrade
- Hunters Run express sewer to transport flow to new Upper Hocking WPCF.
- Baldwin Run Express Sewer.
- Broad Street Pump Station Express Sewer.
- Approximately 208,253 feet of sewer line ranging between 8-inch and 48-inch diameter.

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- Captures all existing wastewater service areas discussed in Section 2.4 to reduce CSO impacts.

2.6.3.1 Advantages for Alternative 2.A.(1):

- The majority of the Hunters Run sewer to the new WPCF is gravity rather than force main.
- Adds flow to Hocking River through Lancaster.
- Less stringent treatment limits than for a Hunters Run WPCF.
- Diverts flow from YMCA Pump Station and CSOs.

2.6.3.2 Disadvantages for Alternative 2.A.(1):

- New site would need to be acquired, approximately 24 acres (900ft by 1170ft) would be needed for a new WPCF and any required expansions projected for 2045 growth.
- Siting of new facilities are subject to public opposition.
- A WPCF upstream of the Water Treatment Plant could cause regulatory problems.
- Additional staff required to operate two separate facilities.

2.6.4 Alternative 2.A.(2): New Upper Hocking Water Pollution Control Facility and Existing WPCF Upgrade

Construction of an Upper Hocking River WPCF to process projected flows from the Upper Hocking River drainage basin for 2045 would require the following facilities (Refer to Figure 2-10):

- Rock Mill Lift Station.
-Immediate: 1.0 mgd
- Lake and Allen Sewer Separation.

Long Term Control Plan – Addendum

- New Upper Hocking WPCF at Collins Road.
 - Near Term: 2.00 mgd
 - 2025: 1.75 mgd upgrade
 - 2045: 2.20 mgd upgrade
- Upper Hocking Pump Station.
 - Near Term: 4.75 mgd
 - 2025: 4.25 mgd upgrade
 - 2045: 4.0 mgd upgrade
- Hunters Run express sewer to transport flow to the existing WPCF.
- Baldwin Run Express Sewer.
- Broad Street Pump Station Express Sewer.
- Approximately 219,189 feet of sewer line ranging between 8-inch and 48-inch diameter.
- Captures all existing wastewater service areas discussed in Section 2.4 to reduce CSO impacts.

2.6.4.1 Advantages for Alternative 2.A.(2):

- Adds flow to Hocking River through Lancaster.
- Less stringent treatment limits than for a Hunters Run WPCF.
- Routing flow from the Hunters Run basin to the existing plant works well to incorporate the reduction of CSOs.
- Routing flow from the Hunters Run basin to the existing plant maximizes the existing facility's 10 mgd capacity.
- Diverts flow from YMCA Pump Station and CSOs.

2.6.4.2 Disadvantages for Alternative 2.A.(2):

- New site would need to be acquired, approximately 24 acres (900ft by 1170ft) would be needed for a new WPCF and any required expansions projected for 2045 growth.
- Siting of new facilities are subject to public opposition.

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- A WPCF upstream of the Water Treatment Plant could result in regulatory constraints.
- Additional staff required to operate two separate facilities.

2.6.5 Alternative 4.A: New Hunters Run Water Pollution Control Facility without YMCA Pump Station Upgrade

Construction of a WPCF on Hunters Run to treat the projected flows for 2045 west of the City from the Upper Hocking River and Hunters Run drainage basins within the U.S. 33 Bypass development areas would require the following facilities (Refer to Figure 2-11):

- Rock Mill Lift Station.
-Immediate: 1.0 mgd
- Lake and Allen Sewer Separation.
- New Hunters Run WPCF.
-Near Term: 2.00 mgd
-2025: 2.25 mgd upgrade
-2045: 2.50 mgd upgrade
- Upper Hocking Pump Station.
-Near Term: 6.5 mgd
-2025: 4.0 mgd upgrade
-2045: 4.5 mgd upgrade
- Hunters Run express sewer to transport flow to the existing WPCF.
- Baldwin Run Express Sewer.
- Broad Street Pump Station Express Sewer.
- Approximately 235,595 feet of sewer line ranging between 8-inch and 48-inch in diameter.
- Captures all existing wastewater service areas discussed in Section 2.4 to reduce CSO impacts.

2.6.5.1 Advantages for Alternative 4.A.:

- Hunters Run WPCF rural location may avoid strong public opposition.

Long Term Control Plan – Addendum

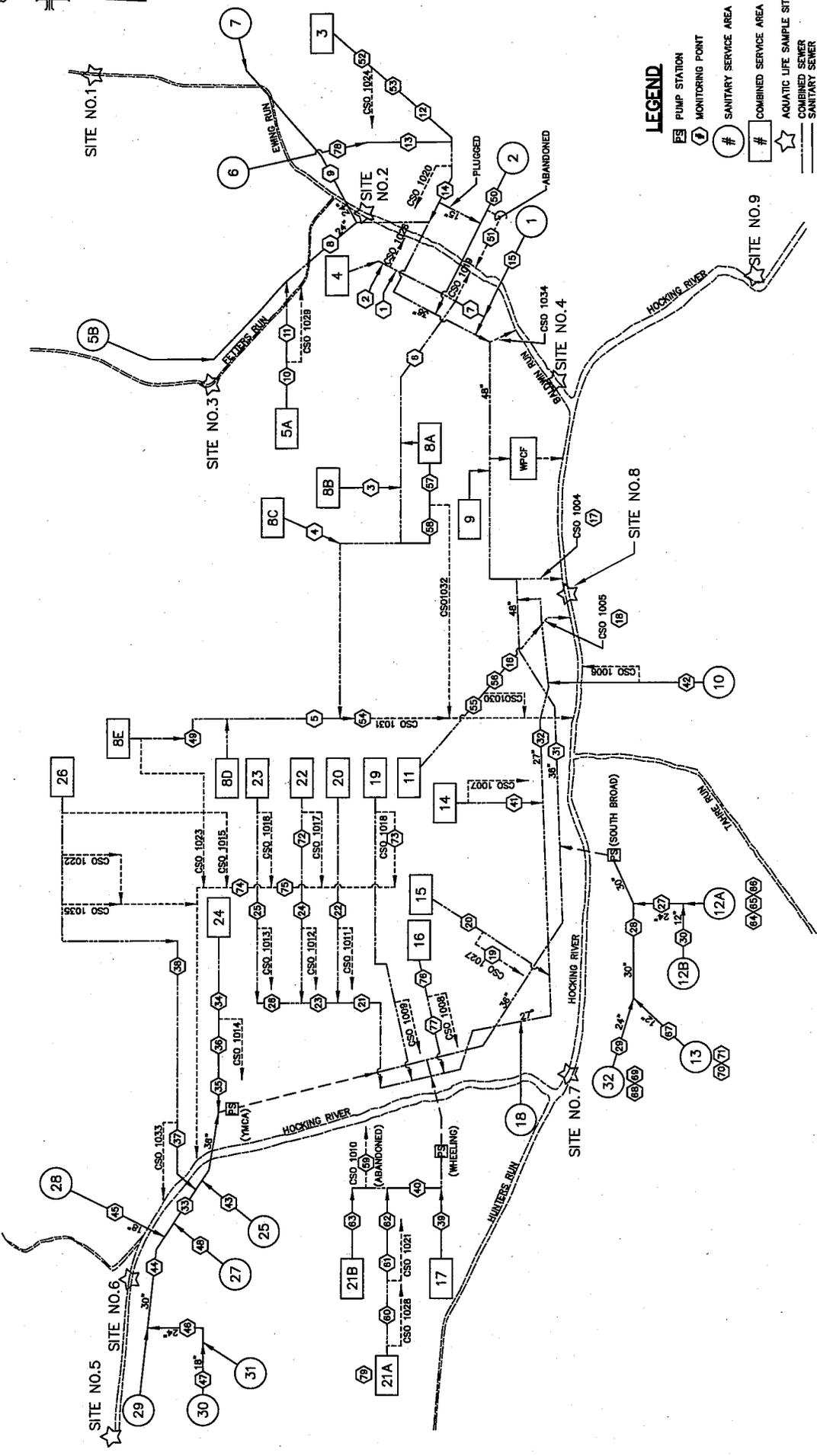
- Diverts flow from YMCA Pump Station and CSOs

2.6.5.2 Disadvantages for Alternative 4.A.:

- The Ohio EPA may limit the Hunters Run WPCF effluent to a maximum of 3.0 MGD to maintain water quality standards based on the low-flow condition of Hunters Run. If this would occur, the remaining treated effluent anticipated from the proposed WPCF would have to be discharged to the Hocking River to meet projected 2025 and 2045 needs.
- The line to discharge treated effluent to the Hocking is extremely long.
- Level of treatment required to discharge to Hunters Run is higher than for the Hocking River.

2.7 SELECTED ALTERNATIVE

Lancaster City staff and Malcolm Pirnie evaluated the advantages and disadvantages of the four alternatives to determine a recommendation for the wastewater collection system and treatment needs. The selection was Alternative 2.A.(1): A New Upper Hocking River Water Pollution Control Facility (Treat Upper Hocking and Hunters Run Basins).



- LEGEND**
- PUMP STATION
 - MONITORING POINT
 - SANITARY SERVICE AREA
 - COMBINED SERVICE AREA
 - AQUATIC LIFE SAMPLE SITE
 - COMBINED SEWER
 - SANITARY SEWER
 - FORCE MAIN
 - CSO DISCHARGE

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CITY OF LANCASTER, OHIO
 LONG TERM CONTROL PLAN - APPENDUM
 EXISTING WASTEWATER SYSTEM SCHEMATIC

MALCOLM PIRNIE

Drawn by: [unreadable] Date: 07/2003 Scale: 1" = 1000' (Horizontal) 1" = 20' (Vertical) Title: Existing Wastewater System Schematic

Figure 2-4
Long Term Control Plan - Addendum
Master Plan Alternative 1: No New Satellite WPCF
Flow Chart

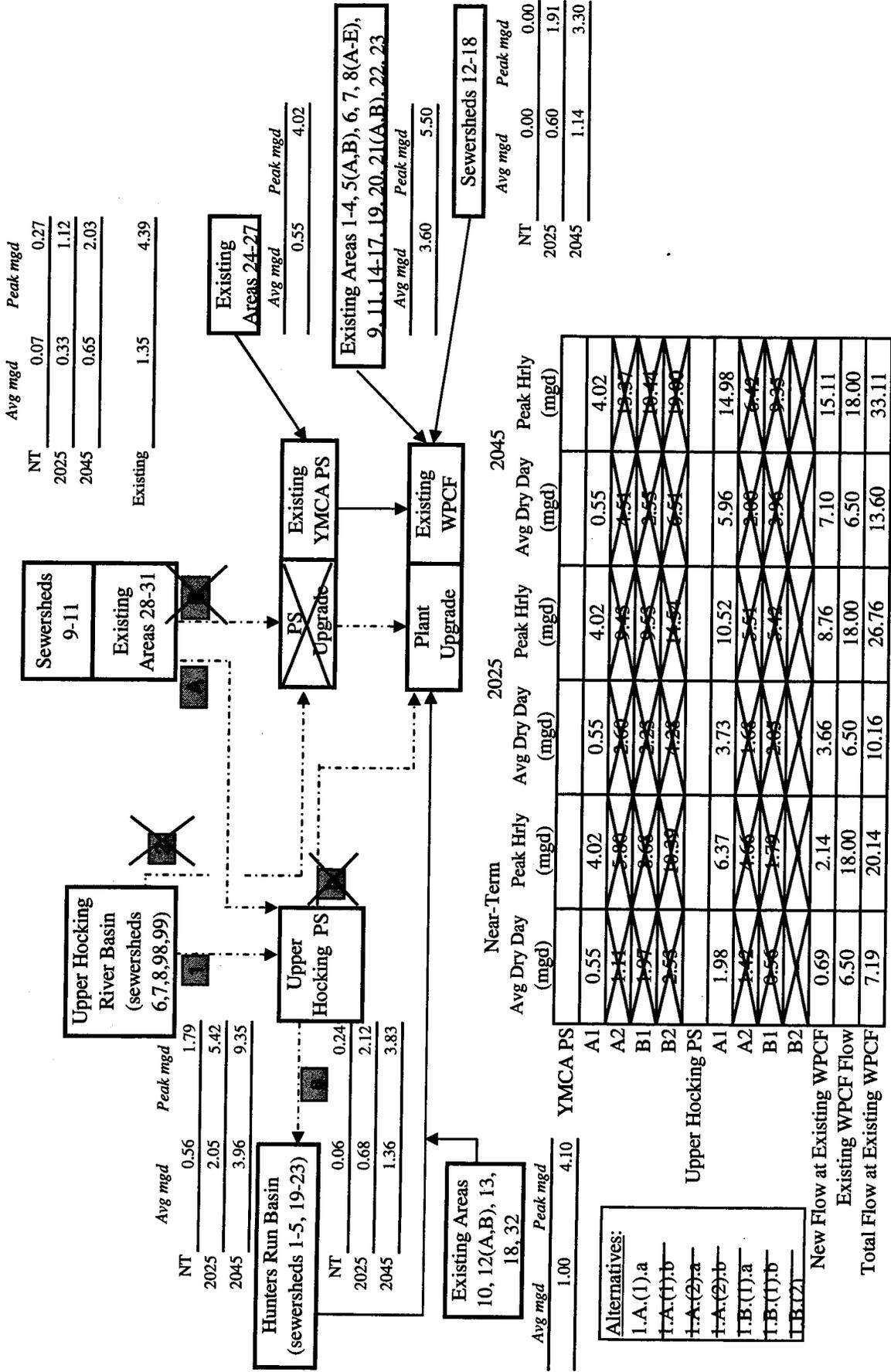


Figure 2-5
Long Term Control Plan - Addendum
Master Plan Alternative 2: New Upper Hocking WPCF
Flow Chart

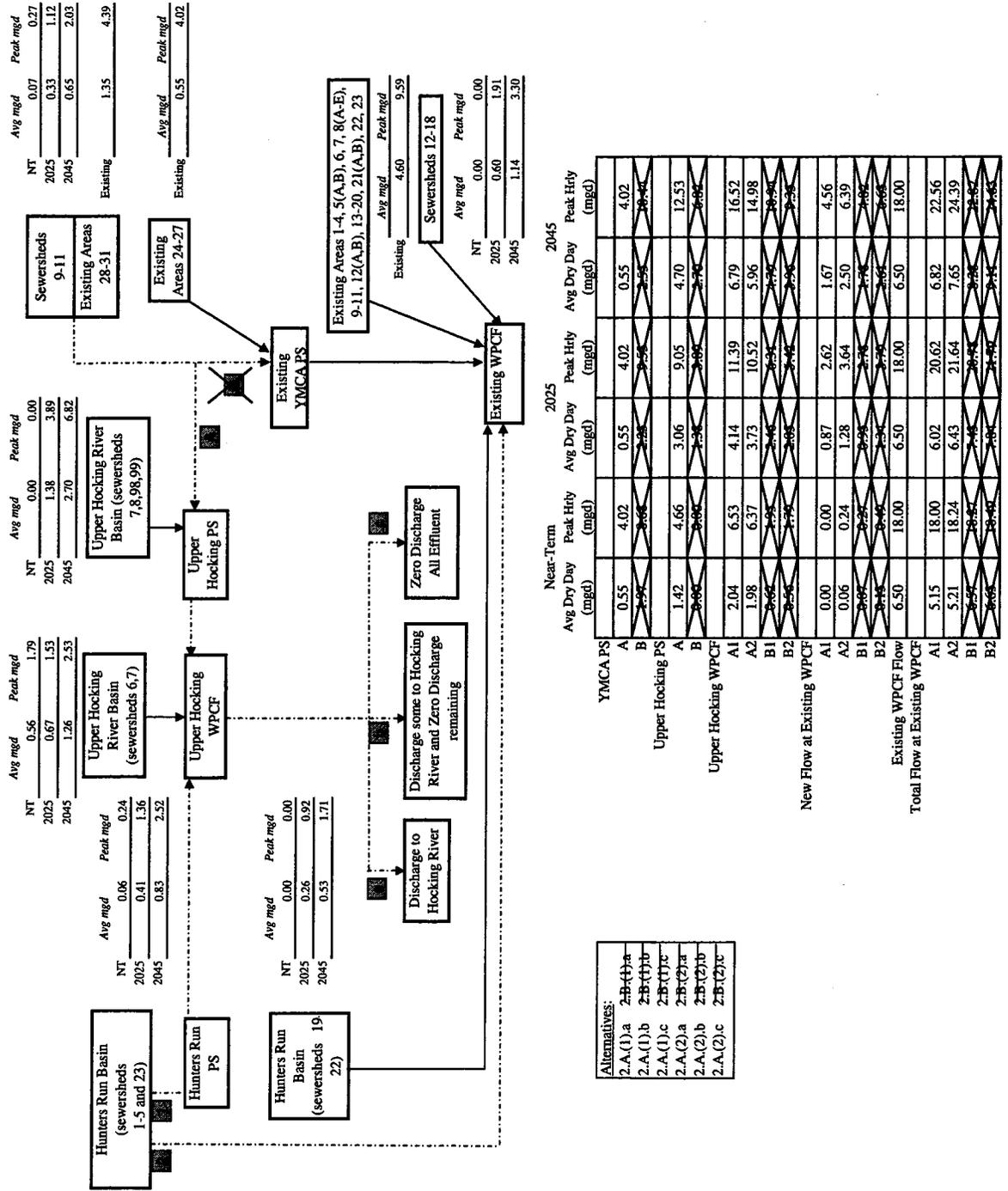
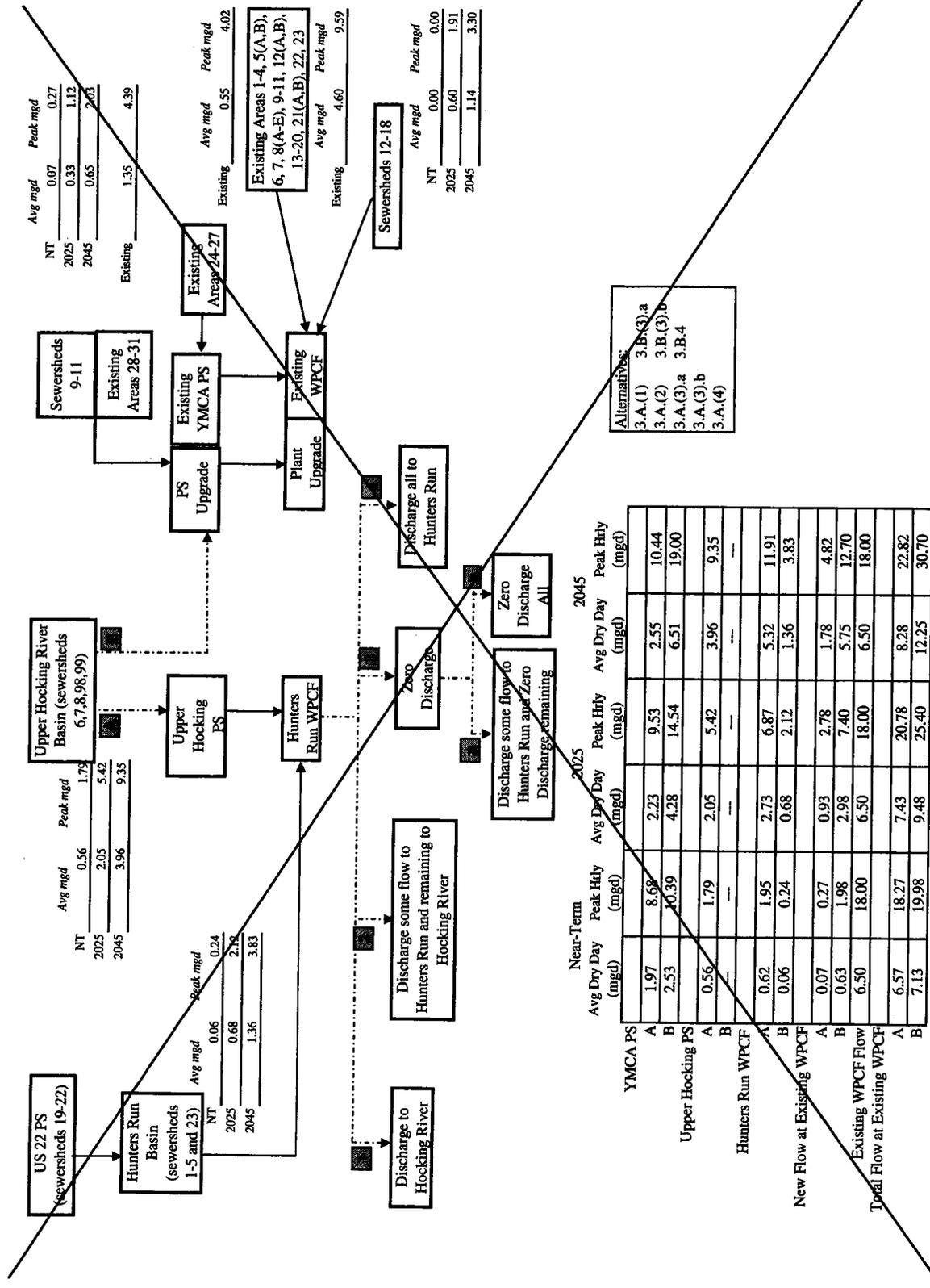


Figure 2-6
Long Term Control Plan - Addendum
Master Plan Alternative 3: New Hunters Run WPCF with YMCA Pump Station Upgrade
Flow Chart



	Avg mgd	Peak mgd
NT	0.07	0.27
2025	0.33	1.12
2045	0.65	2.03
Existing	1.35	4.39

	Avg mgd	Peak mgd
Existing	0.55	4.02

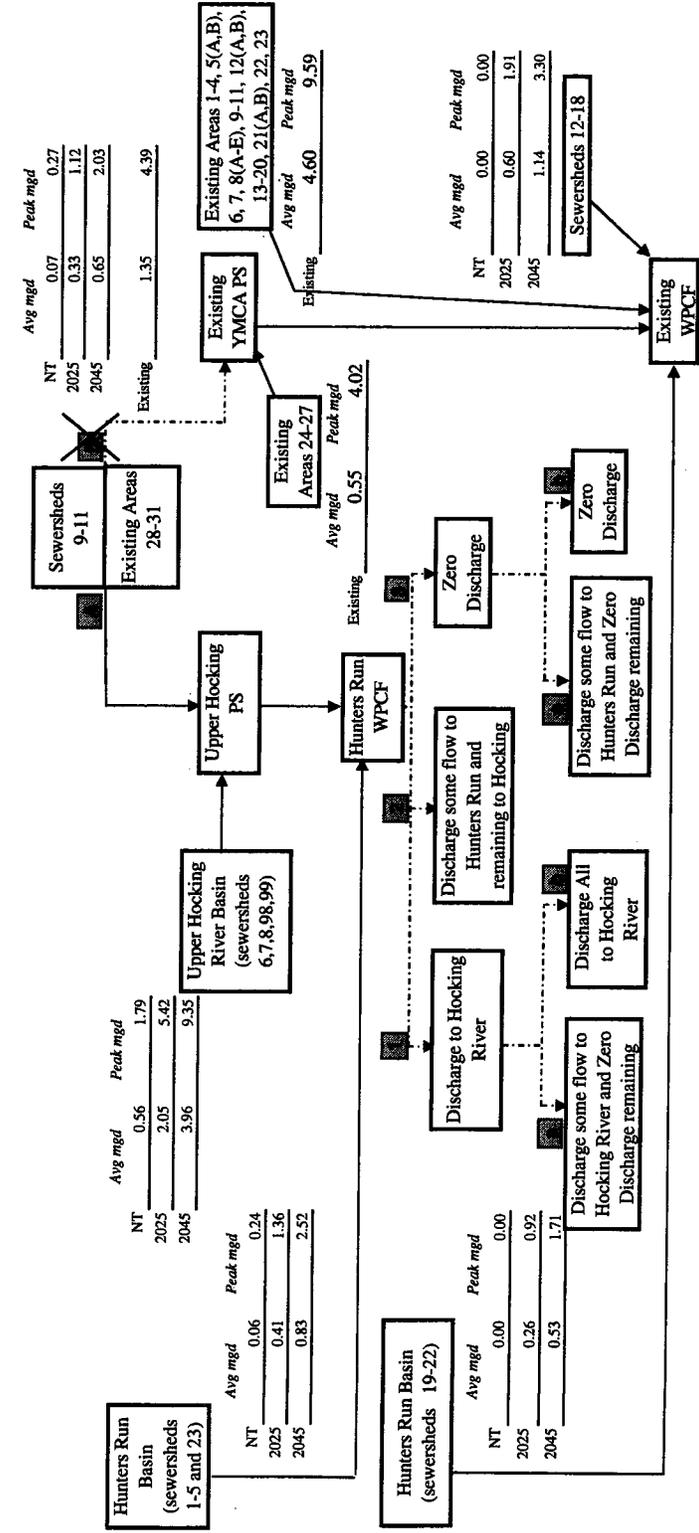
	Avg mgd	Peak mgd
Existing	4.60	9.59

	Avg mgd	Peak mgd
NT	0.00	0.00
2025	0.60	1.91
2045	1.14	3.30

	Near-Term			2025			2045		
	Avg Dry Day (mgd)	Peak Hrly (mgd)	Peak Hrly (mgd)	Avg Dry Day (mgd)	Peak Hrly (mgd)	Peak Hrly (mgd)	Avg Dry Day (mgd)	Peak Hrly (mgd)	Peak Hrly (mgd)
YMCA PS									
A	1.97	8.68	2.23	9.53	2.55	10.44			
B	2.53	10.39	4.28	14.54	6.51	19.00			
Upper Hooking PS									
A	0.56	1.79	2.05	5.42	3.96	9.35			
B									
Hunters Run WPCF									
A	0.62	1.95	2.73	6.87	5.32	11.91			
B	0.06	0.24	0.68	2.12	1.36	3.83			
New Flow at Existing WPCF									
A	0.07	0.27	0.93	2.78	1.78	4.82			
B	0.63	1.98	2.98	7.40	5.75	12.70			
Existing WPCF Flow									
A	6.50	18.00	6.50	18.00	6.50	18.00			
Total Flow at Existing WPCF									
A	6.57	18.27	7.43	20.78	8.28	22.82			
B	7.13	19.98	9.48	25.40	12.25	30.70			

Alternatives:
3.A.(1)
3.A.(2)
3.A.(3).a
3.A.(3).b
3.A.(4)

Figure 2-7
Long Term Control Plan - Addendum
Master Plan Alternative 4: New Hunters Run WPCF without YMCA Pump Station Upgrade
Flow Chart



	Near-Term			2025			2045		
	Avg Dry Day (mgd)	Peak Hrly (mgd)	Avg Dry Day (mgd)	Peak Hrly (mgd)	Avg Dry Day (mgd)	Peak Hrly (mgd)	Avg Dry Day (mgd)	Peak Hrly (mgd)	
YMCA PS	A	0.55	4.02	0.55	4.02	0.55	4.02	0.55	4.02
	B	1.98	6.68	3.28	9.58	3.55	10.48	3.55	10.48
Upper Hocking PS	A	1.98	6.37	3.73	10.52	5.96	14.98	5.96	14.98
	B	6.58	1.79	3.68	3.42	3.98	3.35	3.98	3.35
Hunters Run WPCF	A	2.04	6.53	4.14	11.39	6.79	16.52	6.79	16.52
	B	6.62	1.98	3.46	6.34	7.79	10.90	7.79	10.90
New Flow at Existing WPCF	A	-	-	0.87	2.62	1.67	4.56	1.67	4.56
	B	6.68	6.27	6.98	3.78	3.62	6.62	3.62	6.62
Existing WPCF Flow	A	6.50	18.00	6.50	18.00	6.50	18.00	6.50	18.00
	B	6.50	18.00	6.50	18.00	6.50	18.00	6.50	18.00
Total Flow at Existing WPCF	A	5.15	18.00	6.02	20.62	6.82	22.56	6.82	22.56
	B	6.57	18.87	3.48	26.74	3.38	25.87	3.38	25.87

- Alternatives:
- 4.A.(1).a ~~4.B.(1).a~~
 - 4.A.(1).b ~~4.B.(1).b~~
 - 4.A.(2) ~~4.B.(2)~~
 - 4.A.(3).a ~~4.B.(3).a~~
 - 4.A.(3).b ~~4.B.(3).b~~

3

Long Term Control Plan – Addendum

3.0 LONG TERM CONTROL PLAN ALTERNATIVES DEVELOPMENT AND ANALYSIS

3.1 INTRODUCTION

The selected Master Plan alternative for the wastewater collection and treatment system (discussed in Chapter 2) will result in additional peak wastewater flow to the City of Lancaster existing Water Pollution Control Facility. The current average flow for the plant is approximately 6.5 MGD. Peak flows of 18 MGD are successfully treated through the plant's secondary (biological) treatment units. It is estimated that the selected Master Plan alternative (Alternative 2.A.(1): New Upper Hocking Water Pollution Control Facility) will result in a peak rate of 38 MGD at the plant. As discussed in Section 1, the peak rate is based on a 3-month, 2-hour design storm. In addition, even if all flows that reach the existing WPCF are treated, there will still be CSOs occurring in the system during wet weather events.

Alternatives for handling the increased peak flows include the installation of equalization facilities at the existing WPCF, installation of physical/chemical high-rate treatment (HRT) facilities at the existing WPCF for treatment of peak flows to primary treatment levels, and installation of a parallel secondary treatment facility at the existing WPCF. For each of these alternatives, full implementation of Master Plan Alternative 2.A.(1) would occur.

As required by the City's NPDES permit, the Long Term Control Plan Addendum must consider the complete elimination of CSO structures. Complete separation of the sewer system is the only practical way to achieve complete elimination of all CSO discharges. Since the Master Plan did not evaluate complete sewer separation, it will be evaluated here as a fourth Long Term Control Plan Addendum alternative. However, for this alternative, full implementation of Master Plan Alternative 2.A.(1) will not occur as further explained hereafter. Refer to Figure 3-5 and Table C-1 for details regarding Master Plan Alternative 2.A.(1).

Long Term Control Plan – Addendum

The following is a list of the Long Term Control Plan alternatives that will be evaluated. Refer to Figure 3-1 for a summary of the Master Plan and Long Term Control Plan Addendum alternatives development and analysis process.

- Alternative 1 – Provide Storage (Master Plan Alternative 2.A.(1) plus Equalization at the Existing WPCF).
- Alternative 2 – Provide Physical/Chemical Treatment (Master Plan Alternative 2.A.(1) plus Physical/Chemical High Rate Treatment (HRT) at the Existing WPCF).
- Alternative 3 – Provide Additional Full Secondary Treatment (Master Plan Alternative 2.A.(1) plus Additional Full Secondary Treatment at the Existing WPCF).
- Alternative 4 – Provide Complete Sewer Separation (Master Plan Alternative 2.A.(1) modified plus complete sewer separation).

3.2 ALTERNATIVE 1: PROVIDE STORAGE

3.2.1 General Description

Alternative 1 will provide for the treatment of high flows by providing storage for the excess flow during wet weather events. Storage would be provided by constructing an equalization (EQ) basin(s). An EQ basin captures and stores some of the combined sewer wet weather flows that would otherwise be discharged to the receiving stream. The stored flow is subsequently returned to the WPCF for full treatment after the wet weather event is over and the plant has available treatment capacity.

In this alternative, an off-line EQ basin is evaluated. To store the excess volume during the design storm, it was estimated that the EQ basin must be approximately 2.0 million gallons. In addition, a bar rack and pump station capable of handling 20 MGD would be required prior to the EQ basin. A process schematic is provided in Figure 3-2.

3.2.2 Benefits

- Maximizes use of existing WPCF capacity.

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- Can provide stable flow to the WPCF.
- Requires little operation and maintenance.
- Provides ability to easily respond to arbitrary weather patterns.
- Reduces pollutant loading to receiving stream.

3.2.3 Disadvantages

- Costly.
- Large footprint.
- Potential odor problems.
- Negative aesthetic impact.
- Environmental assessment may be required if area of construction is large.
- May cause permit violations due to mass loadings unless Ohio EPA modifies the existing permit.

3.2.4 Implementation Plan

Table 3-1 presents the assumed implementation plan with costs for Alternative 1. Refer also to Table B-1 in Appendix B. Table 3-1 includes only those costs associated with the minimization of CSO and does not include costs for new growth. It includes costs proportional to the existing separate sanitary flow that will be rerouted from the existing WPCF and pumped and treated via the proposed Upper Hocking Pump Station (PS), force main (FM) and Water Pollution Control Facility (WPCF). It also does not include maintenance or upgrades to the existing collection system or existing WPCF.

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**Table 3-1
Implementation Plan for Alternative 1**

Project Description	Construction Completion Year	Project Capital Cost	Project O&M Cost
Lake/Allen Sewer Separation	2008	\$4,139,000	\$0
Upper Hocking WPCF (partial)	2009	\$13,359,000	\$832,308
Upper Hocking PS and FM (partial)	2009	\$1,926,000	\$40,000
Broad Street PS Express Sewer (ID 70 & 71)	2015	\$944,000	\$0
Baldwin Run Express Sewer (ID 75)	2015	\$328,000	\$0
Existing WPCF Equalization	2015	\$14,229,000	\$75,000
Total Future CSO Costs		\$34,925,000	\$947,308

3.3 ALTERNATIVE 2: PROVIDE PHYSICAL/CHEMICAL TREATMENT

3.3.1 General Description

Alternative 2 provides primary (or better than primary) treatment levels using high-rate physical / chemical treatment units (HRT).

High-rate physical/chemical treatment processes have quickly grown in popularity for wet weather treatment. This is primarily due to the ability of the process to adapt to various quantities of flow, intermittent flows, and influent water qualities.

The USFilter Kruger ACTIFLO® system is the high-rate treatment process chosen for evaluation. However, if high-rate treatment is chosen as the selected alternative, an analysis of the various manufacturers which provide high-rate treatment should be conducted.

The ACTIFLO process combines ballasted flocculation and inclined plate settling. First, the wastewater must be screened. Then, a coagulant is added to the raw wastewater to destabilize the suspended particles. The wastewater flows into a flash mix tank where flocculent aid polymer and microsand is added. The flocculent aid and sand help to promote large, stable floc formations. After the mix tank, the water flows into a

Long Term Control Plan – Addendum

maturation tank where mixing is continued but in a mild manner. The flocs leave the maturation tank and flow to the settling tank where the flocs settle and are subsequently removed from the water by inclined plate settling. Laminar upflow through the inclined plate zone removes the smaller floc and suspended solids. The treated wastewater then exits the system via a trough or weir to the receiving stream or disinfection system. Typical performance for these systems is presented below in Table 3-2.

**Table 3-2
Typical Performance of the ACTIFLO System**

Parameter	Percent Removal
TSS	90 – 95%
BOD (Total)	50 – 80%
Total Phosphorus	80 – 95%
COD	50 – 70%
Metals	50 – 90%
Fecal Coliform	85 – 95%
TKN	10 – 40%

In order to provide high-rate physical/chemical treatment at the City of Lancaster WPCF, a new bar rack and influent pump station is required as well as screens, and disinfection facilities. Each of these items must be sized for 20 MGD. A process schematic is provided in Figure 3-3.

3.3.2 Benefits

- Due to the high overflow rate and short retention time, the system has a very small footprint.
- High-rate treatment can perform well under a variety of conditions.
- Quick start-up.
- Provides advanced primary treatment and disinfection for wet weather flows (based upon design storm)
- Reduces pollutant load to receiving stream.

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3.3.3 Disadvantages

- Requires fine screening and disinfection.
- Does not provide same level of treatment as full secondary treatment.
- Generates chemical sludge stream from high-rate treatment facilities.
- Requires use and on-site storage of chemicals.
- May cause permit violations due to mass loadings unless Ohio EPA modifies the existing permit.

3.3.4 Implementation Plan

Table 3-3 presents the assumed implementation plan with costs for Alternative 2. Refer also to Table B-2 in Appendix B. Table 3-3 includes only those costs associated with the minimization of CSO and does not include costs for new growth. It includes costs proportional to the existing separate sanitary flow that will be rerouted from the existing WPCF and pumped and treated via the proposed Upper Hocking Pump Station (PS), force main (FM) and Water Pollution Control Facility (WPCF). It also does not include maintenance or upgrades to the existing collection system or existing WPCF.

**Table 3-3
Implementation Plan for Alternative 2**

Project Description	Construction Completion Year	Project Capital Cost	Project O&M Cost
Lake/Allen Sewer Separation	2008	\$4,139,000	\$0
Upper Hocking WPCF (partial)	2009	\$13,284,000	\$832,308
Upper Hocking PS and FM (partial)	2009	\$1,729,000	\$40,000
Broad Street PS Express Sewer (ID 70 & 71)	2015	\$944,000	\$0
Baldwin Run Express Sewer (ID 75)	2015	\$328,000	\$0
Existing WPCF HRT	2015	\$17,783,000	\$125,000
Total Future CSO Costs		\$38,207,000	\$997,308

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3.4 ALTERNATIVE 3: PROVIDE ADDITIONAL FULL SECONDARY TREATMENT

3.4.1 General Description

This alternative provides for complete treatment (through secondary treatment) of the additional flows as a result of reduced CSO discharges.

This alternative essentially provides for a parallel treatment plant to the existing plant. Such a facility would likely include a new headworks, primary treatment, secondary treatment, and disinfection. A process schematic is provided in Figure 3-4.

The increase in peak flow (above the current WPCF peak capacity) estimated with the design storm model simulation is estimated at 20.0 MGD. Therefore, the parallel treatment train evaluated in this alternative is sized for 20.0 MGD (peak).

3.4.2 Benefits

- Complete treatment provided for wet weather flows (based upon design storm).
- Operator familiarity with processes.

3.4.3 Disadvantages

- Costly.
- Large footprint.
- May cause permit violations due to mass loadings unless Ohio EPA modifies the existing permit.
- Environmental assessment may be required if area of construction is large.
- Significant increase in amount of equipment to operate and maintain.

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3.4.4 Implementation Plan

Table 3-4 presents the assumed implementation plan with costs for Alternative 3. Refer also to Table B-3 in Appendix B. Table 3-4 includes only those costs associated with the minimization of CSO and does not include costs for new growth. It includes costs proportional to the existing separate sanitary flow that will be rerouted from the existing WPCF and pumped and treated via the proposed Upper Hocking Pump Station (PS), force main (FM) and Water Pollution Control Facility (WPCF). It also does not include maintenance or upgrades to the existing collection system or existing WPCF.

**Table 3-4
Implementation Plan for Alternative 3**

Project Description	Construction Completion Year	Project Capital cost	Project O&M Cost
Lake/Allen Sewer Separation	2008	\$4,139,000	\$0
Upper Hocking WPCF (partial)	2009	\$13,284,000	\$832,308
Upper Hocking PS and FM (partial)	2009	\$1,729,000	\$40,000
Broad Street PS Express Sewer (ID 70 & 71)	2015	\$944,000	\$0
Baldwin Run Express Sewer (ID 75)	2015	\$328,000	\$0
Additional Full Secondary Treatment at Existing WPCF	2015	\$62,136,000	\$500,000
Total Future CSO Costs		\$82,560,000	\$1,372,308

3.5 ALTERNATIVE 4: PROVIDE SEWER SEPARATION

3.5.1 General Description

Sewer separation typically requires a new sewer to be constructed (either storm or sanitary) in the area served by the existing combined sewer. The new sewer will allow for the separation of the sanitary and storm flows. Sanitary sewage is then conveyed to the wastewater plant for treatment and stormwater is discharged to the nearest receiving stream.

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For this alternative, it was assumed that new storm sewers would be installed next to the existing combined sewer at a minimum depth of cover to capture existing stormwater sources. Clear water sources such as roof drains and street curb inlets would be connected to the new storm sewer. Private sources of stormwater (roof drains, foundation drains, etc.) may still be connected to the sanitary sewer depending upon the extent of previous inflow and infiltration work.

For Alternatives 1 through 3, master Plan Alternative 2.A.(1) would be fully implemented. However, for this alternative, the complete separation would negate the need to construct the Broad Street Pump Station Express Sewer and the Baldwin Run Express Sewer. All other parts of Master Plan alternative 2.A.(1) would be implemented.

3.5.2 Benefits

- Reduction in basement flooding.
- Reduction in street flooding.
- Prevents discharge of dilute sanitary sewage to receiving waters.
- CSO regulations will no longer apply.

3.5.3 Disadvantages

- Requires extensive construction and will cause significant associated disruption.
- Storm sewer discharges will greatly increase, which will contribute more pollutant load to the receiving streams since the first flush will no longer be treated. May decrease water quality if mitigation does not also occur.
- Many unknown factors (costs) involved.

3.5.4 Implementation Plan

Table 3-5 presents the assumed implementation plan with costs for Alternative 4. Refer also to Table B-4 in Appendix B. Table 3-5 includes only those costs associated with the minimization of CSO and does not include costs for new growth. It includes costs proportional to the existing separate sanitary flow that will be rerouted from the

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existing WPCF and pumped and treated via the proposed Upper Hocking Pump Station (PS), force main (FM) and Water Pollution Control Facility (WPCF). It also does not include maintenance or upgrades to the existing collection system or existing WPCF.

**Table 3-5
Implementation Plan for Alternative 4**

Project Description	Construction Completion Year	Project Capital cost	Project O&M Cost
Lake/Allen Sewer Separation	2008	\$4,139,000	\$0
Upper Hocking WPCF (partial)	2009	\$13,284,000	\$832,308
Upper Hocking PS and FM (partial)	2009	\$1,729,000	\$40,000
Sewer Sheds 3, 4, 5, 8A, 8B, 8C, & 8D Separation	2011	\$19,622,000	\$0
Sewer Sheds 9, 11, 14, 15, 16, 17, 19, & 20 Separation	2013	\$17,639,000	\$0
Sewer Sheds 21A, 21B, 22, 23, 24, & 26 Separation	2015	\$22,060,000	\$0
Total Future CSO Costs		\$78,473,000	\$872,308

3.6 ECONOMIC EVALUATION OF ALTERNATIVES

3.6.1 Cost Comparison

A preliminary, planning-level cost estimate was completed for each alternative. The total construction cost was then annualized over a 20-year period at an interest rate of 4.0%. Table 3-6 presents the cost estimates for each of the alternatives. Detailed cost estimates are provided in Appendix B and Appendix C.

3.6.2 Impact on User's Rates

To analyze the effect on user's rates for each alternative, O&M costs for the current WPCF operations were estimated for the years 2005 to 2025. Then, for each alternative, the annualized capital cost and O&M costs were added to the current operations costs. Table 3-6 shows the results of this analysis. Costs for both CSO abatement and future

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growth were included. The average yearly rate increase over the 11 year period and total increase over the 2005 rates are listed.

**Table 3-6
Alternatives Cost Comparison**

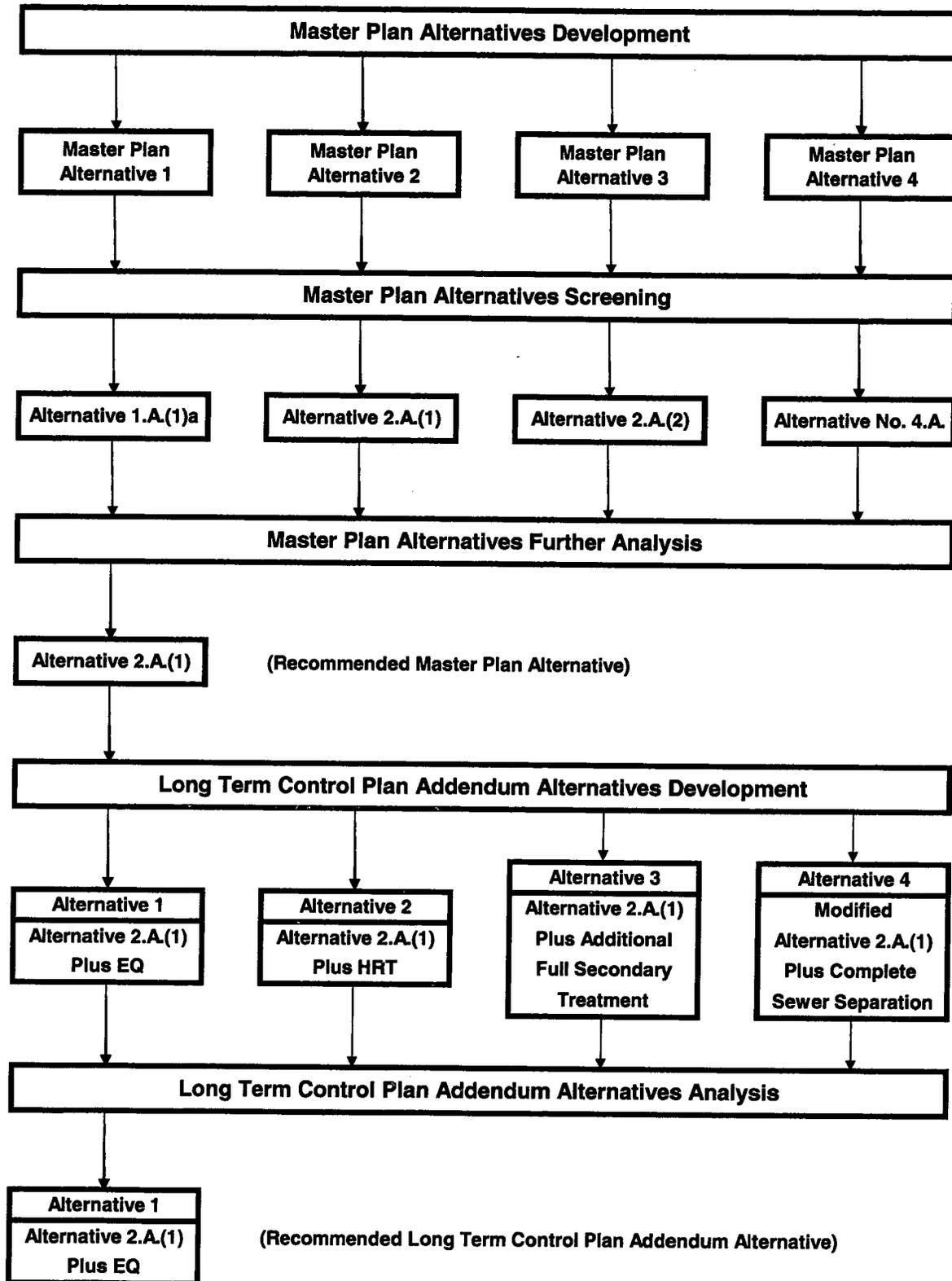
	Alternative No. 1	Alternative No. 2	Alternative No. 3	Alternative No. 4
	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)
Existing Ann Debt and O&M (2004)	\$6,889	\$6,889	\$6,889	\$6,889
Existing Annual O&M (2004)	\$4,316	\$4,316	\$4,316	\$4,316
Prop CSO Abatement Annual O&M	\$947	\$997	\$1,372	\$872
Other Future Projects Annual O&M	\$1,073	\$1,073	\$1,073	\$1,073
Subtotal Annual O&M	\$6,336	\$6,386	\$6,761	\$6,261
Inflation at 3% for 11 Years	\$2,434	\$2,454	\$2,598	\$2,406
Total Annual O&M (2015)	\$8,770	\$8,839	\$9,358	\$8,666
Existing Annual Debt (2004)	\$2,573	\$2,573	\$2,573	\$2,573
Prop CSO Abatement Annual Debt	\$2,570	\$2,811	\$6,075	\$5,774
Other Future Projects Annual Debt	\$3,356	\$3,356	\$3,356	\$3,356
Total annual Debt (2015)	\$8,499	\$8,741	\$12,004	\$11,703
Total Annual Costs (2015)	\$17,269	\$17,580	\$21,363	\$20,370
Total Increase in Rates	150.7%	155.2%	210.1%	195.7%
Net annual Increase in Rates	8.71%	8.89%	10.84%	10.36%

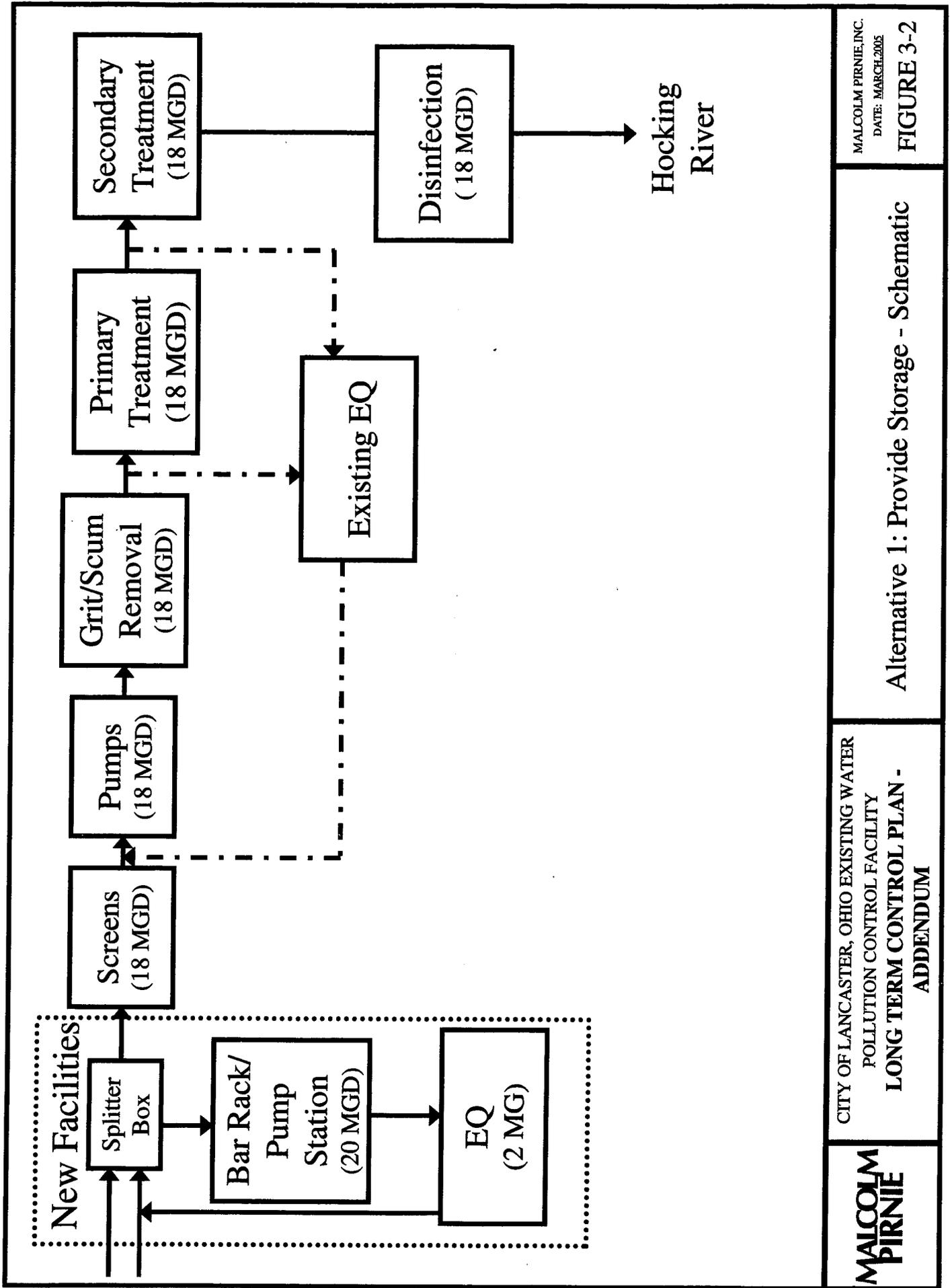
3.7 SELECTED ALTERNATIVE

As shown in Table 3-6, Alternative 1: Provide Storage is the most cost-effective treatment for peak flows at the Lancaster Water Pollution Control Facility and results in the lowest increase in users rates. It also provides full secondary treatment for all flows that reach the WPCF in lieu of advanced primary treatment if the HRT system was selected, thereby minimizing pollutant discharges. Therefore, Alternative 1 is the recommended alternative.

FIGURE 3-1

CITY OF LANCASTER
LONG TERM CONTROL PLAN - ADDENDUM
ALTERNATIVES DEVELOPMENT AND ANALYSIS SUMMARY





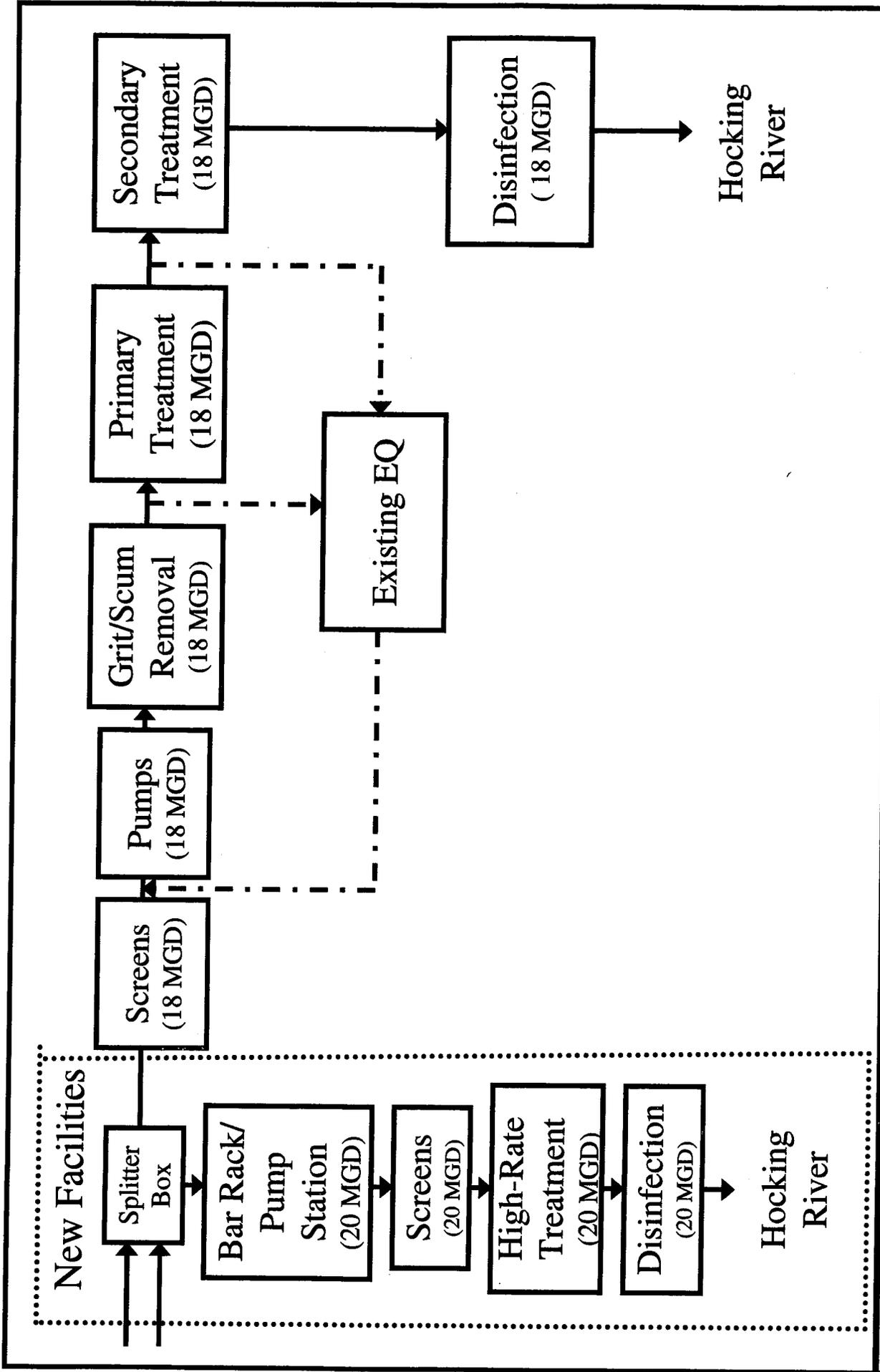
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DATE: MARCH 2005

FIGURE 3-2

Alternative 1: Provide Storage - Schematic

CITY OF LANCASTER, OHIO EXISTING WATER
POLLUTION CONTROL FACILITY
LONG TERM CONTROL PLAN -
ADDENDUM

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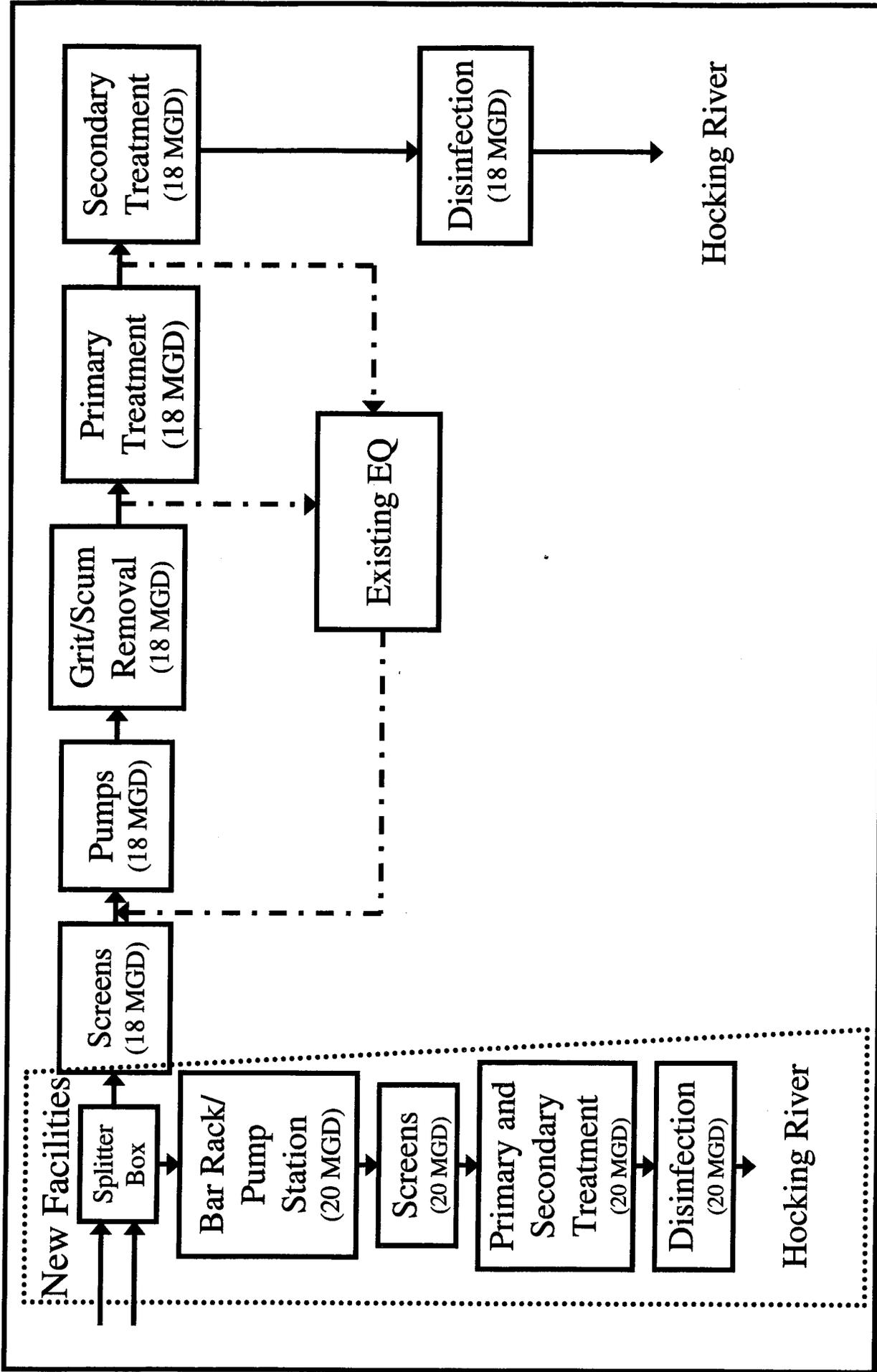


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 DATE: MARCH 2005
 FIGURE 3-3

Alternative 2: Provide Physical/Chemical Treatment - Schematic

CITY OF LANCASTER, OHIO EXISTING WATER POLLUTION CONTROL FACILITY
 LONG TERM CONTROL PLAN - ADDENDUM

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CITY OF LANCASTER, OHIO EXISTING WATER
 POLLUTION CONTROL FACILITY
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Alternative 3: Provide Additional Full
 Secondary Treatment - Schematic

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 FIGURE 3-4

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4

Long Term Control Plan - Addendum

4.0 IMPLEMENTATION

4.1 FINANCIAL CAPABILITY

As required by the City of Lancaster NPDES Permit, an affordability analysis of the recommended alternative was performed according to USEPA guidelines given in "Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development."

This analysis has two parts, a residential indicator of capability and a permittee financial indicator. In order to analyze the financial capability of the City of Lancaster for the proposed CSO control measures, the affordability analysis was conducted for the annualized cost of the selected alternatives. The results are discussed below and the detailed worksheets are available in Appendix D.

The permittee's financial indicator score is determined by the evaluation of selected factors that help to portray the City of Lancaster's socioeconomic conditions, current debt situation, and financial procedures. The City of Lancaster's financial indicator was found to be in mid-range.

The residential indicator requires the calculation of the cost per household (CPH) for the service area residents for current and future wastewater treatment and CSO control costs. The median household income (MHI) is then used along with the CPH to estimate the residential indicator, which represents the impacts on local residents. The residential indicator was found to be in the mid-range for the recommended alternatives.

Table 4-1 shows the results of the affordability analysis for the selected alternatives. The recommended alternatives result in a medium burden for the citizens of Lancaster.

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Table 4-1
Projected Cost per Household and Financial Indicators

Current (2004) WPC Costs:	\$ 6,889,000
Projected Additional Costs (in 2004 dollars):	\$ 6,500,000
Projected CSO Control Costs (in 2004 dollars):	\$ 3,800,000
Total Costs:	\$ 17,269,000
Residential Share of Costs (58.5%):	\$ 10,102,000
Number of Households:	15,157
Adjusted Median Household Income:	\$ 37,781
Cost Per Household:	\$ 666
Residential Indicator:	1.76% Mid Range
Financial Capability Indicator Score:	2.5 Mid Range
Financial Capability:	Medium Burden

The CSO financial capability guidelines suggest an implementation period of up to 10 years for communities which will experience a medium burden due to the cost of CSO improvement projects. This guideline matches the implementation plan suggested for the recommended alternative as outlined in Table 3-1.

4.1 EFFECTS OF GROWTH ON SEWER SYSTEM AND ENVIRONMENT

4.2.1 Change in CSO Frequencies and Volume

As discussed in the Chapter 3, the City of Lancaster is planning to implement an alternative which significantly decreases the frequency and volume of CSOs and the total discharge volume of CSO, even with significant planned growth. Table 4-2 and Figure 4-1 show the significant reduction in frequency and volume of overflows from the CSOs that were addressed in the most recent NPDES permit. CSO 1020 has been closed. CSOs 1004, 1006, and 1034 will each overflow 3 or fewer times per year. The overflow from these CSOs has been reduced by more than 99%.

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4.2.2 Change in Frequency of Plant Bypasses

There will be no increase in the frequency of plant bypasses. The City of Lancaster has chosen an alternative which allows more flow to be treated and decreases the amount that is bypassed.

4.2.3 Change in Water Quality

The City of Lancaster is not considering any alternatives that will cause an increase in combined sewer overflows, therefore, there will be no water quality impacts on the stream. Thus, there will be no need to perform an economic or social justification of the increased discharges.

4.2.4 Antidegradation Addendum

There will be no need to perform an economic or social justification of discharges because there will be no increase in the volumes of CSO discharges. An antidegradation application is attached as Appendix E.

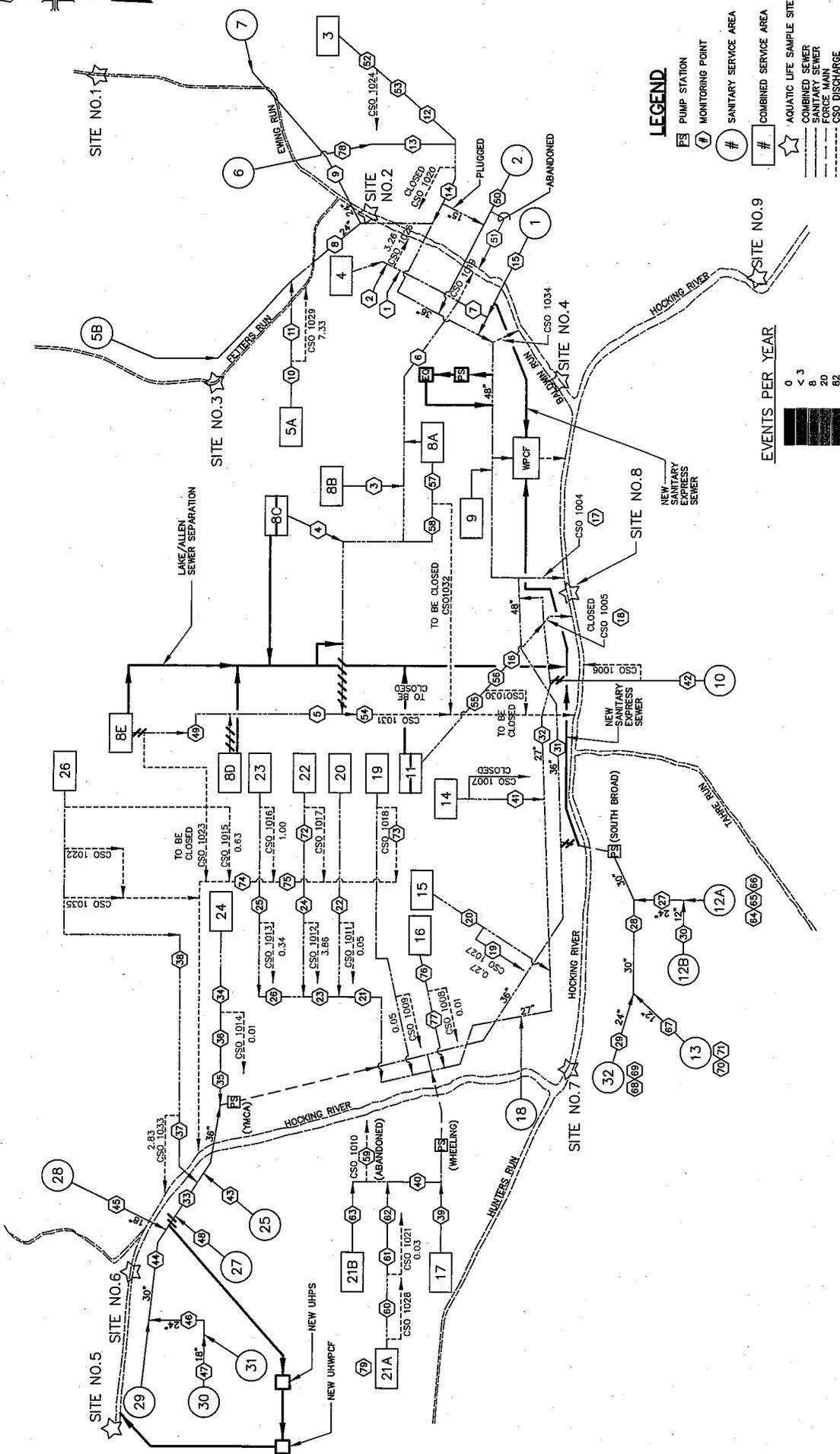
TABLE 4-1

**CITY OF LANCASTER
LONG TERM CONTROL PLAN - ADDENDUM
CHANGES IN FREQUENCY AND VOLUME OF CSO
ALTERNATIVE 1**

CSO No.	Status	Proposed Alternative Total Overflows (2025)		Base System Total Overflows (1995)		Annual Overflow Reduction	
		annual mil gal	events/yr each	annual mil gal	events/yr each	mil gal	%
CSO 1004		0.00	<3	8.53	8	8.53	>99%
CSO 1005	closed	0.00	0	20.77	82	20.77	100%
CSO 1006		0.00	<3	2.86	8	2.86	>99%
CSO 1007	closed	0.00	0	0.00	0	0.00	n/a
CSO 1008		0.01	8	2.77	8	2.77	>99%
CSO 1009		0.05	8	0.04	8	0.00	-7%
CSO 1010	closed	0.00	0	-0.01	0	-0.01	n/a
CSO 1011		0.05	82	0.06	82	0.00	4%
CSO 1012		3.86	20	3.99	20	0.13	3%
CSO 1013		0.34	82	0.33	82	-0.01	-4%
CSO 1014		0.01	20	0.01	20	0.00	1%
CSO 1015		0.63	20	0.56	20	-0.07	-12%
CSO 1016		1.00	82	0.99	82	-0.01	-1%
CSO 1017		0.00	<3	0.00	<3	0.00	n/a
CSO 1018		0.00	<3	0.00	<3	0.00	n/a
CSO 1019		0.00	<3	55.93	82	55.93	>99%
CSO 1020	closed	0.00	0	0.00	0	0.00	n/a
CSO 1021		0.03	8	0.03	8	0.00	-1%
CSO 1022		0.00	<3	0.00	<3	0.00	n/a
CSO 1023	to be closed	0.00	0	0.00	<3	0.00	n/a
CSO 1024		0.00	<3	0.00	<3	0.00	n/a
CSO 1026		3.26	82	3.14	82	-0.12	-4%
CSO 1027		0.27	82	1.76	82	1.49	85%
CSO 1028		0.00	<3	0.00	<3	0.00	n/a
CSO 1029		7.33	82	7.06	82	-0.27	-4%
CSO 1030	to be closed	0.00	0	0.00	0	0.00	n/a
CSO 1031	to be closed	0.00	0	5.30	82	5.30	>99%
CSO 1032	to be closed	0.00	0	0.00	0	0.00	n/a
CSO 1033		2.83	82	2.83	82	0.00	0%
CSO 1034		0.00	<3	0.75	8	0.75	>99%
CSO 1035		0.00	<3	0.00	<3	0.00	n/a
Total		19.66		117.69		98.04	83%

* Based upon 3-month design storm

** Based upon 4 typical rainstorms for the City of Lancaster – refer to Characterization Studies for additional info.



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FIGURE 4-1

CITY OF LANCASTER, OHIO
LONG TERM CONTROL PLAN - ADDENDUM
WASTEWATER SYSTEM SCHEMATIC W/ IMPLEMENTATION OF ALTERNATIVE 1

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